

# HathiTrust Mobile: Usability Testing

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Word count: 4,261

## Executive Summary

For this study we conducted usability tests of HathiTrust Mobile. We approached this study with two main research questions: how well can users navigate within HathiTrust Mobile, and how easily can users acquire a document from HathiTrust Mobile in their desired format? The study aims to provide insights into user behaviors in order to guide design improvements that could enrich the user experience of HathiTrust Mobile.

For the tests, we recruited six subjects - none familiar with HathiTrust Mobile - from the target populace to perform six tasks each (one participant only completed five). These tasks were specifically designed to examine key digital library functions such as searching, filtering search results, retrieving documents, reading documents, downloading documents, and book check-out. The first user was arranged as a pilot tester to ensure the clarity and adequacy of our tasks and test environments. We made sure to create a consistently professional and comfortable testing environment, using an iPad 2 for all tests. A pre-test questionnaire was administered to all users in order to capture demographic and background information. All team members were present for each usability test, but the participant's interactions with the iPad were recorded to allow for further review in order to confirm findings. After each usability test, the participant was debriefed and asked follow-up questions. The questionnaires, interviews, and video recordings were collected and analyzed. Observations were compared and the most common issues were evaluated and rated for severity, and recommendations were developed from the findings.

### Key findings:

- Searching within text provides results with the query term highlighted, but once the user goes to the page containing the text, it is no longer highlighted, which caused frustration.
- There is no method for selecting multiple search filters at one time, and selected filters are not presented on the search results page, which confused some users.
- Users had difficulty finding their way back to previous menus and results pages.
- Users are confused when they cannot advance document pages with a swiping gesture.

All users expressed interest in the site and said they would use it again. All of them commented that despite its flaws, they found the site relatively easy to use. They were pleasantly surprised by several functions of HathiTrust Mobile, including free downloads of the books.

### Recommendations:

- Extend in-text search query highlighting to the documents themselves.
- Explicitly display active filters on the results page; allow users to select multiple filters at one time.
- Redesign the navigation link at the top of the page to either resemble other links throughout the HathiTrust site or use language that is more familiar to users.
- Enable the swiping gesture for PageTurner on HathiTrust Mobile.

## Introduction

The system we are evaluating is HathiTrust Mobile (<http://m.hathitrust.org/>), the mobile web application for HathiTrust Digital Library (<http://www.hathitrust.org/>), a large-scale repository of digitized content from the collections of major research libraries and institutions. HathiTrust is a collaborative effort of more than 60 contributing institutions that are dedicated to securely preserving human knowledge for use both today and in the future.

HathiTrust Mobile, specifically, is a version of the HathiTrust Digital Library website optimized for use on mobile devices. A project of the University of Michigan Library UX Department, HathiTrust Mobile focuses on the catalog search and full-text reading (referred to as PageTurner) functions of the main site. It also allows users associated with its partner institutions to download full-text materials in PDF or ePub formats. Because the mobile application is web-based, it is accessible across all platforms and can be used from mobile devices, including phones and tablets, as well as laptops and desktops.

HathiTrust Mobile launched in the fall of 2011. However, the UX Department staff was unable to test the site as extensively as they would have liked, and are consistently finding bugs. The goals of our project are to identify further bugs to be fixed, recommend design ideas to improve the site's current navigation and gauge how well users are being served by the site.

The current users of the HathiTrust regular site are largely academics—librarians, professors, students and researchers—as well as hobbyists interested in topics ranging from genealogy to boat restoration. Although the user base for the mobile site is less clear, HathiTrust Mobile is not designed for researchers as it lacks the full-text search function of the regular site; its users are likely members of the general public who are interested in reading digitized content from a mobile device.

In this phase of our evaluation of HathiTrust Mobile, we conducted in-depth usability testing on the site with five users. We approached this study with two main research questions: how well can users navigate within HathiTrust Mobile, and how easily can users acquire a document from HathiTrust Mobile in their desired format? We designed tasks to evaluate the overall functionality of HathiTrust Mobile in allowing users to perform essential tasks, such as finding relevant documents, reading documents, navigating through documents to find relevant information, and obtaining documents in both physical and digital formats. Usability testing allowed us to confirm findings from earlier phases of our evaluation, such as comparative analysis and heuristic evaluation, and identify additional findings based on users' interactions with the site. Our increased understanding of confirmed findings and identification of new findings will allow us to evaluate current issues with HathiTrust based on their severity and develop recommendations to fix some of the site's current bugs and improves its overall user experience.

## Methods

We sought to recruit participants who fit within our target demographic of adults who own internet-enabled mobile devices. Prior knowledge of HathiTrust was not a requirement for participation because we did not feel this would affect a user's engagement with HathiTrust Mobile for a usability test. We recruited four of six total participants (five for the main tests and one for the pilot test) by following up with respondents to our survey on mobile reading habits who had indicated interest in participating in a usability test for an incentive. The other two participants were recruited by word-of-mouth. All participants were paid \$20 for their time. The participants ranged in age from 23 to 32, had at least a bachelor's degree, and all owned at least one iOS device (e.g. iPad, iPhone). Only one participant owned an Android device. Five of six participants read documents on their mobile devices, and they rated their satisfaction level with reading on their mobile devices as 3.8 out of 5 on average. Full demographic and screening questions and answers can be found in Appendix A.

For the usability tests, we developed six tasks in total for users to complete that we felt would encourage them to engage fully with HathiTrust Mobile and complete essential tasks. The last task required a log-in for a HathiTrust partner institution, so one user who did not have a username only completed five of the six tasks. The tasks asked users to perform functions such as searching for a book based upon certain criteria, locating a hard copy of a book in a local library, searching for keywords within a book's text and downloading a book in ePub format. A copy of the tasks for the usability tests can be found in Appendix B.

All tests were performed on an iPad 2. Each participant's interactions with the iPad were recorded using a document camera and digital audio recorder. The process for each usability test was as follows. The participant was given a brief introduction to the process of usability testing by the moderator and asked for consent to record his or her testing session. Each of the tasks was read out loud to the participant, and then he or she was handed the instructions on a piece of paper for review throughout that task. As the participant performed each task, he or she was asked to "think out loud" and describe what he or she was doing and thinking, as well as the motivations for his or her actions. Upon completion of a task, the participant notified the moderator, who proceeded to give instructions for the next task. After the participant completed all tasks, a member of our team followed up with some debriefing questions. Some of the questions were asked of all participants (a list of these questions can be found in Appendix C), and others were directly related to instances from that participant's test. At the conclusion of the debriefing, each participant was given his or her financial incentive, thanked, and dismissed.

To analyze the data from the usability tests, we met as a team to review our notes from observing the tests and identified some of the major issues that we saw. Next, we reviewed video footage from each of the tests (each video was independently reviewed by two team members) to identify any critical incidents or issues that we may have missed and shared those with the rest of the team. Finally, we took the list of issues and incidents and rated them according to a 5-point severity scale (the table of issues and key to the scale can be

found in Appendix D) in order to determine what the key findings would be from the study. From those findings, we developed recommendations that we felt would help improve the user experience of HathiTrust Mobile.

## Findings and Recommendations

### Summary Findings

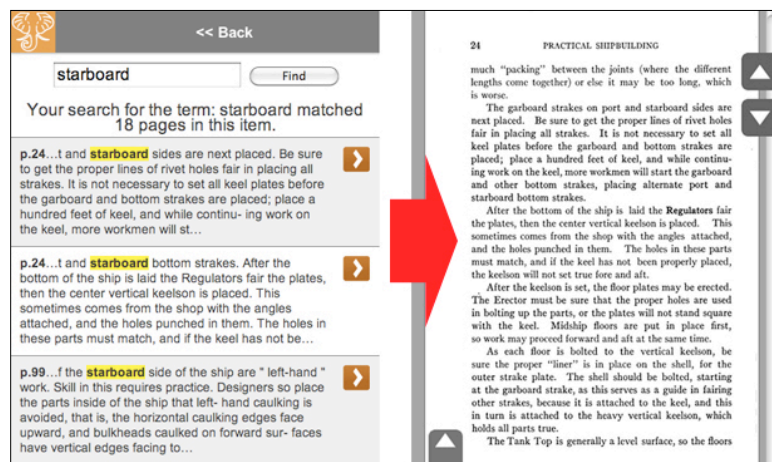
Overall, we found that participants were able to successfully perform the tasks in the usability tests, and were satisfied with their experience of the site despite some frustrations. All five participants indicated in debriefing interviews that they would use HathiTrust Mobile again in the future, and participants who were affiliated with the University of Michigan expressed excitement that they could download books using HathiTrust Mobile. However, our usability testing also allowed us to identify some new areas of improvement for HathiTrust Mobile, including in-text search, filtering, navigation, and page advancement, which are discussed in more detail below.

### Key Findings

**Finding 1: Searching within text provides results with the query term highlighted, but once the user goes to the page containing the term, it is no longer highlighted, which caused frustration.**

*Severity Rating: 4.25/5*

Task 4 asked the user to search within a document for the word “starboard.” Each participant expressed some level of surprise when, upon clicking on a result, they found that the word they searched for was not highlighted in the document (See Figure 1). User 3 simply remarked, “It doesn’t highlight it... it didn’t highlight it,” and then resolved to scan the page for the word, eventually finding it. This response, although negative, was a mild one. User 6 had a similar response and searched again for the word thinking that it would be highlighted the second time, but it was not. During the post-test debrief, when asked about her feelings about the word not being highlighted in the text, she stated, “At first I thought I did something wrong.” User 2,



**Figure 1: Screenshots showing disconnect between highlighting in the search results and the lack thereof in the document.**

however, gave up searching for the word briefly after selecting one of the results. She said, "It didn't show the word I searched for. It doesn't highlight it... so, I couldn't find the word."

This finding points to a violation of Jakob Nielsen's Consistency and Standards heuristic, which was used earlier in this project during the Heuristic Evaluation (Nielsen and Mack, 1994). This heuristic asks whether the site design and functionality is consistent throughout, as well as consistent with industry standards. A standard feature found in document viewing software and web browsers is highlighting a search term throughout the document or on the current page. This standard is so commonplace that all users we tested commented that they expected it to happen in HathiTrust Mobile. Furthermore, when PageTurner returns a list of results, the search term is highlighted, which sets up the expectation that it will also be highlighted in the document. It is not surprising, then, that one user responded that she felt she had done something wrong when she clearly saw that the term was highlighted in the search results, and then found that it was not highlighted in the document.

**Recommendation 1: Extend in-text search query highlighting to the documents themselves.**

Extending this feature will improve consistency within the application, as well as among industry standards. Currently, the search results are returned in plain text, which can be easily highlighted, but if the text of the document is recognizable, then it is possible that it, too, can be highlighted. This will ultimately reduce user confusion and encourage users to utilize the in-text searching capability of the mobile site.

**Finding 2: There is no method for selecting multiple search filters at one time, and selected filters are not presented on the search results page, which confused some users.**

*Severity Rating: 3.88/5*

Search result filtering is integral to ensuring that users are able to increase search precision and locate the documents they are looking for efficiently. Our participants' performances highlighted several critical issues in HathiTrust Mobile's filtering function. For task 1, where users were asked to locate a document by Mark Twain written between 1870 and 1879, none of the users had a problem using Mark Twain as a search query to return documents written by and about the author. However, all five users required shuffling back and forth between the filtering screen and search results in order to enter the second criteria (1870-1879) for the task. Four of the users commented that the display was ambiguous and they were not sure if the filtering provided accurate results. One user asked, "Where is my filter?" when she did not see it listed on the search results page. Another asked, "Is there a way to have more than one filter?" after being limited to selecting one filter before being returned to the search results page. All five users expressed uncertainty about how to select multiple filters. Here again, the omission of an active filter display on the search results page fed into the users' confusion. One commented, "I was not sure if I could amalgamate the filter. I want to see which filter I

applied. I was not sure if I had 2 filters going at the same time or just the second one I selected.”

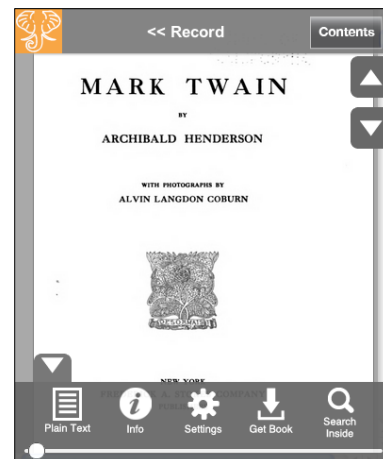
**Recommendation 2: Explicitly and prominently display active filter(s) on the results page; allow users to select multiple filters at one time.**

The usability test again highlights the importance of the search and filter functions of HathiTrust Mobile. Searching on HathiTrust Mobile produces a high recall rate, but we believe that the filtering on the site could be improved in order to increase search precision. Allowing users to select more than one filter at a time would make it more efficient for them to refine their search results. We also suggest prominently displaying the actively selected filters on the search results page in order to minimize confusion about whether or not the filters are in place. Some users indicated that they would like to see some filtering options right on the initial search page, which could be helpful as well.

**Finding 3: Users had difficulty finding their way back to previous menus and results pages.**

*Severity Rating: 3.88/5*

Throughout the entire HathiTrust Mobile site there is only one way to go back a page without using the browser’s back button: these characters, “<<,” with the page name that will be returned to. For example, when a user is reading a document in PageTurner there is “<< Record” at the top of the window (See Figure 2). Clicking this does take the user back to the record, but it can also be misconstrued as the title of the page due to its location. Also, it is inconsistent in appearance with other hyperlinks on the site. Other hyperlinks are orange and underlined, but this link at the top of the page is white with no text decoration. Furthermore, the two angle brackets are not a conventional symbol for directing users. When faced with this design choice, users defaulted to using the browser back button, which yielded the intended result of returning to the previous page, in most cases.



*Figure 2: Image showing double angled brackets at the top of the page.*

This issue became problematic when the user performed a search inside of a document. When the application returned a list of search results, the user clicked on one to be redirected to the result within the document. If the user decides this is not what they were looking for, they will inevitably want to return to the search results to choose another option. Clicking again on the “Search Inside” icon will bring back the search results, but this is not clear to users. Instead, they stuck with what they know and clicked the back button in the browser, which led them out of the document, and back to the record, not the search results, and effectively caused them to lose their place in the document.



User 5 had the most significant trouble with this issue. Upon experiencing it, she stated, “I wanted to go back to the page that had the results and I clicked back and I didn’t get it. Maybe you have to click ‘Record.’ No, that’s not it. I have to redo the search ... which is kind of annoying, to be honest.” Annoyance is not a goal of any application, and it should be avoided. It can lead to users becoming frustrated and ultimately abandoning the application.

### Recommendation 3:

Redesign the navigation link at the top of the page to resemble other links throughout the HathiTrust site and/or use language that is more familiar to users. Changing the color of the link to orange and underlining it will signify to users that it is a hyperlink, and changing the wording of the link to just say, “Back,” would consistently signal to users that they can use this link to navigate within the document without the frustration of losing their place.

Also, replacing the double angle brackets with a small image of an arrow would be more consistent with web standards as well as the rest of the site. The most useful arrow occurs when search results are returned. It is an orange square with a white angled bracket (See Figure 3) Placing this at the top of the page instead of the double angle brackets will look more intentional and signal to users that they are supposed to click it to return to the previous page.

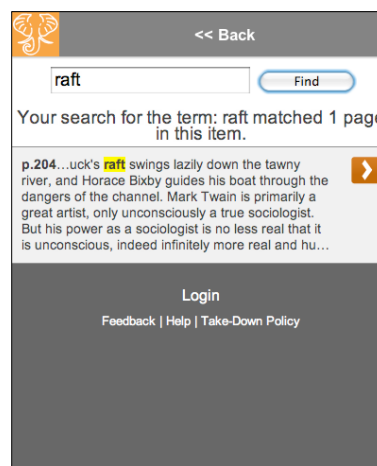


Figure 3: Image showing recommended arrow image for use in to navigation.

### Finding 4: Users are confused when they cannot advance document pages with a swiping gesture.

Severity Rating: 3.63/5

Because one of the major functionalities of HathiTrust Mobile is reading digitized documents, and because users who do not have an institutional login can only read documents online, we specifically designed our tasks to give us an opportunity to see users advance through documents as if they were reading them. In observing how readers advance through documents, we noticed that all five participants in our study attempted to use a swiping gesture that imitates the turning of pages in an actual book. (In HathiTrust Mobile, users reading on the digitized image view must simply tap the page they want to turn, while users reading in the plain-text view scroll up and down the document vertically as they would on any other website.)

While most users were able to adjust to tapping after a few attempts at swiping, two users in particular relied on other methods of page advancement due to their frustration with the lack of swiping functionality. User 3 decided to use the progress bar at the bottom of the page instead, noting “I thought it would respond to my fingers but it’s not so I’m using this little scroll-y thing at the bottom ... there’s got to be an easier way to do this.” (He later



realized he could tap the edge of the pages.) User 2 developed a strategy of switching to plain-text view when she wanted to scroll through the document, then switching back to the digitized image view when she arrived at the page she was looking for.

Based on think-aloud comments, post-test debriefing answers, and our own prior experience with mobile devices and reading applications, we know that users attempt to use the swiping gesture because it is the predominant method of advancing pages on touchscreen devices in reading applications like Google Books, iBooks, and Kindle. We also found this during our comparative analysis between HathiTrust Mobile and other mobile reading systems. User 5 made specific comments about her inability to advance pages by swiping in HathiTrust Mobile compared to in other systems, such as “I was trying to swipe but it wasn’t swiping like it does on the other reading programs,” while other users commented that they expected to be able to swipe because they do on their iPhone or because they were using an iPad for the usability testing (User 6: “I feel like flipping with your fingers is standard, especially when you’re using with an iPad”; User 5: “Swiping is ... it’s an iPad, you’re supposed to be able to swipe”; User 3: “With the iPhone, you do a lot of swiping.”)

#### **Recommendation 4: Enable the swiping gesture for PageTurner on HathiTrust Mobile.**

Although all five of our users were able adjust to HathiTrust Mobile’s tapping page advancement gesture or find an acceptable workaround, enabling users to advance pages using the swiping gesture would increase the application’s ease of use and improve its consistency with similar systems and applications. The fact that all five of our users were already familiar with the swiping gesture indicates that enabling swiping will eliminate the need for users to learn a new gesture, increasing HathiTrust Mobile’s appeal to users who are already comfortable reading on their mobile devices, a key segment of the system’s target population.

## **Discussion**

Although we feel that we were able to identify a number of major findings and from those, a number of useful recommendations, we recognize that there were some limitations to our usability tests. One major limitation was the homogeneity of our participants. Only two of the six participants were not graduate students, and there was only a nine year range in the ages of the group. After reaching out to survey respondents for recruiting and successfully scheduling four users (three of whom were graduate students), we decided in the interest of time to ask acquaintances to be the last two participants. We recognize that having a more diverse user group could potentially have led to different testing experiences.

Another limitation to our study has to do with the testing environment. Although it would be ideal to conduct usability tests in an environment natural to the user, we had to work with the equipment and facilities that we had at our disposal, which meant that we had to make some compromises. Since HathiTrust Mobile is optimized for mobile devices, we of

course wanted to conduct the usability tests on a mobile device, which meant that we needed to capture the user's actions on an external camera. In order to ensure that the document camera properly captured the user's interactions with the iPad, we had to set the camera up on a small stand directly between the user and the iPad. We asked our pilot study participant whether this interfered with her ability to complete the tasks normally, and she indicated that it was not a problem, but we did observe that certain users found it to be more of an inconvenience than others.

Finally, again due to time constraints, we had to limit the scope of our usability tests in a couple of ways. First, we made the decision only to test using an iPad. HathiTrust Mobile's analytics indicate that most users access the site from an iPad or other iOS device, so we felt that an iPad would be the best device to test with in order to align with the experience of many current users. Additional testing could take place across a number of devices and platforms in order to ensure that users are consistently having the same experience with the site. Second, we had to limit the scope of the user tasks in order to keep the length of the usability test manageable for participants. We feel that we covered a large range of the interactions available to users on HathiTrust Mobile (see Appendix B for the task descriptions), but certainly could have covered more tasks as well as more complex searches with additional testing.

## Conclusion

We conducted usability testing of HathiTrust Mobile with five participants and six tasks, then analyzed data we had collected through pre- and post-study questionnaires and interviews, video recordings, and our own notes to develop findings. Overall, we found that participants did not have any major difficulties with the system, and all five participants indicated that they would use HathiTrust mobile again. However, our usability testing did allow us to identify new areas of improvement in the system and confirm some of our findings from earlier research reports. The key findings from our usability test pertain to in-text search, filtering, navigation, and page advancement.

To improve the in-text search, page advancement, filtering, and navigation of HathiTrust Mobile we recommend extending in-text search query highlighting to documents, displaying active filters on the search results page, allowing users to select multiple filters, redesigning the navigation at the top of the page to be more obvious and helpful to users, and enabling swiping gestures to advance pages. We believe that implementing these recommendations will improve the user experience of the site and increase users' abilities to access digitized documents with HathiTrust Mobile.

## References

Nielsen, J., & Mack, R. L. (1994). *Usability Inspection Methods*. New York: Wiley.

## Appendices

The following appendices include some of the tools we used to conduct our usability tests, and build our findings and recommendations. These include our user demographic questionnaire, the tasks we asked the participants to perform, our post-test debrief questions, and a severity scale for the issues we found.

## Appendix A – User Demographics Questions and Answers

	Age	Profession	Own iPad?	if yes, times/week use iPad	if no, have you used one?	Mobile devices owned	Do you read on them?	if yes, how often?	if yes, how satisfied are you? (1-5 scale)	Times/week access library on internet	Access library from mobile device?	Have you used HT?	if yes, when/why last used?	Have you used HT mobile?	if yes, when/why last used?	Username?
U1 (Pilot)	23	student	yes	21+		iPhone, iPad, laptop	yes	15 times/week	5	5+	yes	yes	if yes, when/why last used? a record in the library search that led me there	no		yes
U2	30	no	yes	everyday		iPad, iPod Touch	iPad	everyday	4	no	no	no		no		yes
U3	25	student National Accounts	no		yes	iPhone	no			< 1	no	no		no		yes
U4	32	Manager	no		yes	iPhone, Droid Eris	yes	~once a day	iPhone = 4, Droid = 2	5 times/week	no	no		no		no
U5	29	grad student	yes	daily		iPhone, iPad, 2 laptops	iPad, occasionally computer	daily	4	3 to 4	yes	yes	one time in california	no		yes
U6	26	student	no		yes	iPhone	yes	once a week, several times a month	4	4	yes	no		no		yes

## Appendix B – User Demographics Questions and Answers

### *Task 1*

You need to decide on a research paper topic for an American history class and you're considering writing about Mark Twain, but you realize you've never actually read any of his work. Use HathiTrust Mobile to find a book by Mark Twain published between 1870 and 1879, the decade you're most interested in covering for your paper.

### *Task 2*

You've just located a Mark Twain book that you're interested in reading, but you doubt you'll be able to read it in time to use it for your paper—you'd prefer to find a hard copy of the book in a nearby library so you can read it over the summer when you have more free time. Use HathiTrust Mobile to find a hard copy of the book at a library within 5 miles of your current location.

### *Task 3*

You are interested in exploring a potential new hobby—shipbuilding. You decide to search HathiTrust for a guide to historical shipbuilding. Conduct this search using HathiTrust Mobile, and then use filters to locate a handbook on shipbuilding that was published in the early 1920s. Skim through the first couple pages of the first chapter in order to confirm that this book is what you are looking for.

### *Task 4*

Now that you have located your shipbuilding handbook, you want to look specifically at information on your favorite side of the boat, the starboard side. Conduct a search within the document to locate document portions in which “starboard” is mentioned. Visit the first search result and read the first paragraph that mentions “starboard.”

### *Task 5*

You're also interested in finding information about the tools used to repair ships in the early 1900s, but you're not sure where this information would be located in the shipbuilding handbook. Go to the book's table of contents, locate the chapter on shipyard tools, and go to the first page of that chapter.

### *Task 6*

You decide you'd like to have the shipbuilding handbook you've located on hand so you can reference it later, but you're worried that you won't be able to access it if your network connection is slow or unavailable. Download the book in EPUB format so you can access it later.

## Appendix C – Post-test debriefing questions

1. Were these tasks familiar to you—had you performed similar tasks before on HathiTrust, HathiTrust Mobile, or a comparable system?
2. Were you able to complete all of the tasks to your satisfaction? If no, which tasks produced unsatisfactory results, and why?
3. Did you any of these tasks particularly easy or fun? If so, which tasks and why?
4. Did you find any of these tasks particularly difficult? If so, which tasks and why?
5. Would you use HathiTrust Mobile in the future? Why or why not?



## Appendix D – Severity ratings

Usability Test Findings Ranked by Severity	
Finding	Severity Ranking (Team Average)
*Search terms are not highlighted in the text	4.25
*There is no method for selecting multiple search filters at one time, and selected filters are not presented on the search results page	3.875
*Users had difficulty finding their way back to previous menus and results pages	3.875
*Users are confused when they cannot advance document pages with a swiping gesture	3.625
The search algorithm returns different results for very similar queries (e.g., “Ship building” vs. “shipbuilding”)	3.25
Users are not directed to login if they press "ok" in the login message, and downloads do not start automatically after login	3.25
Users are unaware of the find in a library option and go outside the system to late hard copy books	2.5
"Contents" button in PageTurner is hard to find and not always accurate	2.5
The zooming function is not smooth	2.25
Users don't know they can download books or find hard copies	2
The "Go to Full Text" link text often displays incorrectly, e.g. saying "Go to 1921" [book publication year]	1.75
*Denotes key findings listed in the body of this report	